What is Newton’s Second Law of Motion? Virtual Lab

<http://www.glencoe.com/sites/common_assets/science/virtual_labs/E25/E25.html>

\_\_\_\_\_\_\_\_\_\_\_\_\_ is a \_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_ on an object. \_\_\_\_\_\_\_\_\_\_\_\_ force is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_between \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ forces. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ second law of \_\_\_\_\_\_\_\_\_\_\_\_\_\_states that if a net \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ acts on an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. It can be either \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ up) or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ down).

If an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the net \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on it must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that we all \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A notebook \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on a desk is being \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. At the same time, it is being \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, so the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the notebook is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. If an elbow \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the notebook off the desk, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_ longer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by the \_\_\_\_\_\_\_\_\_\_\_\_\_of the desktop, and the notebook \_\_\_\_\_\_\_\_\_\_\_\_\_\_ as it \_\_\_\_\_\_\_\_\_\_\_to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The formula for calculation a force on an object is *F = ma.*

* *F= force*
* *m= mass*
* *a= acceleration*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ contained in an object. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ does \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ change with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

In the previous example, *F* refers to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the notebook, also known as its \_\_\_\_\_\_\_\_\_\_\_\_\_; *m* is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the notebook; and *a* is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ caused by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of any object \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of Earth is 9.8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_per \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ per \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or 9.8 m/s2. This means that at the first \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ will be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of 9.8 m/s2. At 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the object will be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of 19.6 m/s2; at 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, it will be falling at the rate of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and so on.

If the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the notebook is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(\_\_\_\_\_\_\_\_\_\_\_\_\_\_) of the notebook can be calculated using the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ *F= ma*: F= 0.5 kg x 9.8 m/s2= 4.9

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(N) is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ an \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In the example above, F= 4.9 N. Therefore, 4.9 kg m/s2 = 4.9 N

In this virtual lab you will investigate the relationship between mass, acceleration, and force by experimenting with falling objects of various masses under a range of gravitational conditions.

Objectives:

* Relate Newton’s second law of motion to the effect of gravity on falling objects.
* Determine the effect of mass on the acceleration rate of falling objects.
* Observe the effect of gravitational conditions on the rate at which objects of identical mass fall.
* Given mass and acceleration, compute force.

Follow the procedure to complete the lab, chart, and questions.

Chart:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Gravitational Acceleration, Mass, and Weight | | | |  |
| Test/Location | Acceleration (m/s2) | Object | Mass of Object (kg) | Weight of Object (N) | |
| 1 |  |  |  |  | |
| Location 1 |  |  |  |  | |
| Location 2 |  |  |  |  | |
| 2 |  |  |  |  | |
| Location 1 |  |  |  |  | |
| Location 2 |  |  |  |  | |
| 3 |  |  |  |  | |
| Location 1 |  |  |  |  | |
| Location 2 |  |  |  |  | |
| 4 |  |  |  |  | |
| Location 1 |  |  |  |  | |
| Location 2 |  |  |  |  | |
| 5 |  |  |  |  | |
| Location 1 |  |  |  |  | |
| Location 2 |  |  |  |  | |
| 6 |  |  |  |  | |
| Location 1 |  |  |  |  | |
| Location 2 |  |  |  |  | |

Questions:

1. According to Newton’s second law of motion, a net force on an object will cause it to accelerate. How does the Newton’s law relate to the force of gravity?
2. How does the force of gravity affect the rate of acceleration?
3. Describe what happens when identical objects are dropped under different gravitational conditions.
4. Describe what happens when objects of different mass are dropped under same gravitational conditions.
5. What is weight? What is mass? How are mass and weight different?
6. Based on your experience with the experiments, how does mass affect weight?
7. What other conclusions can you draw from the data you collected in your table?